CLAIMS

What is claimed is:

1. A method for forming a multi-layer positive-working imageable element, the imageable element comprising:

a substrate comprising a hydrophilic surface;

an underlayer over the hydrophilic surface of the substrate; and

an imageable layer over the underlayer;

the method comprising the steps of:

(a) coating an underlayer over a hydrophilic surface of a substrate;

(b) coating an imageable layer over the underlayer; and

(c) heating the imageable element at a temperature between about 130°C and about 200°C for a time sufficient to increase resistance of the imageable element to an alkaline developer and to decrease the white light sensitivity of the imageable element;

in which:

the imageable element comprises a photothermal conversion material;

the imageable layer is ink receptive;

the imageable layer is insoluble in the alkaline developer;

the imageable layer comprises:

a first polymeric material, and

an *o*-diazonaphthoquinone containing material; and

the underlayer comprises a second polymeric material.

2. The method of claim 1 in which the imageable element is heated to a temperature between about 130°C and about 200°C for about 30 seconds to about 10 minutes.

3. The method of claim 1 in which the second polymeric material is selected from the group consisting of (1) copolymers that comprise a carboxylic acid, an N-substituted cyclic imide, and an amide functional group; (2)

copolymers that comprise a pendent urea group; and (3) copolymers that comprise a pendent sulfonamide group.

4. The method of claim 1 in which the *o*-diazonaphthoquinone containing material is either a compound that comprises an *o*-diazonaphthoquinone moiety attached to a ballasting moiety that has a molecular weight of at least 1500 but less than about 5000, or a novolac resin derivatized with an *o*-diazonaphthoquinone moiety.

5. The method of claim 4 in which the first polymeric material is either a novolac resin or a novolac resin derivatized with an *o*-diazonaphthoquinone moiety.

6. The method of claim 5 in which second polymeric material is selected from the group consisting of (1) copolymers that comprise a carboxylic acid, an N-substituted cyclic imide, and an amide functional group; (2) copolymers that comprise a pendent urea group; and (3) copolymers that comprise a pendent sulfonamide group.

7. The method of claim 6 in which the imageable element is heated to a temperature between about 130°C and about 200°C for about 30 seconds to about 10 minutes.

8. The method of claim 1 in which the first polymeric material is either a novolac resin or a novolac resin derivatized with an *o*-diazonaphthoquinone moiety.

9. The method of claim 8 in which the second polymeric material is a copolymer that comprises about 25 to about 75 mol% of N-phenylmaleimide; about 10 to about 50 mol% of methacrylamide; and about 5 to about 30 mol% of methacrylic acid.

10. The method of claim 9 in which the second polymeric material comprises about 35 to about 60 mol% of the N-phenylmaleimide; about 15 to about 40 mol% of the methacrylamide; and about 10 to about 30 mol% of the methacrylic acid.

11. The method of claim 8 in which the second polymeric material comprises about 20 to 80 wt% of one of more monomers represented by the general formula:

$$CH_2=C(R)-CO_2-X-NH-CO-NH-Y-Z,$$

in which R is -H or $-CH_3$; X is a bivalent linking group; Y is a substituted or unsubstituted bivalent aromatic group; and Z is -OH, -COOH, or $-SO_2NH_2$.

12. The method of claim 11 in which R is CH_3; X is $-(CH_2CH_2)-$; Y is unsubstituted 1,4-phenylene; and Z is -OH.

13. The method of claim 8 in which the second polymeric material comprises (1) about 10 to 90 mol% of a sulfonamide containing monomer unit; (2) acrylonitrile or methacrylonitrile; and (3) methyl methacrylate or methyl acrylate.

14. The method of claim 8 in which the imageable element is heated to a temperature between about 130°C and about 200°C for about 30 seconds to about 10 minutes.

15. The method of claim 1 in which the first polymeric material is a novolac resin and the *o*-diazonaphthoquinone containing material is novolac resin derivatized with an *o*-diazonaphthoquinone moiety.

16. The method of claim 1 in which the second polymeric material is a copolymer that comprises about 25 to about 75 mol% of N-phenylmaleimide; about 10 to about 50 mol% of methacrylamide; and about 5 to about 30 mol% of methacrylic acid.

17. The method of claim 1 in which the first polymeric material is novolac resin and the *o*-diazonaphthoquinone containing material is a compound that comprises an *o*-diazonaphthoquinone moiety attached to a ballasting moiety that has a molecular weight of at least 1500 but less than about 5000.

18. The method of claim 1 in which the second polymeric material is a copolymer that comprises about 25 to about 75 mol% of N-phenylmaleimide;

about 10 to about 50 mol% of methacrylamide; and about 5 to about 30 mol% of methacrylic acid.

19. A multi-layer positive-working imageable element, the element comprising a substrate comprising a hydrophilic surface; an underlayer over the hydrophilic surface of the substrate; and an imageable layer over the underlayer;

the element prepared by a method comprising the steps of:

(a) coating an underlayer over a hydrophilic surface of a substrate;

(b) coating an imageable layer over the underlayer; and

(c) heating the imageable element at a temperature between about 130°C and about 200°C for a time sufficient to increase resistance of the imageable element to an alkaline developer and to decrease the white light sensitivity of the imageable element;

in which:

the imageable element comprises a photothermal conversion material;

the imageable layer is ink receptive;

the imageable layer is insoluble in the alkaline developer;

the imageable layer comprises:

a first polymeric material, and

an *o*-diazonaphthoquinone containing material; and

the underlayer comprises a second polymeric material.

20. The element of claim 19 in which the imageable element is heated to a temperature between about 130°C and about 200°C for about 30 seconds to about 10 minutes.

21. A method for forming an image, the method comprising, in order, the steps of:

(a) coating an underlayer over a hydrophilic surface of a substrate;

(b) coating an imageable layer over the underlayer and forming a multi-layer, positive-working imageable element; and

(c) heating the imageable element at a temperature between about 130°C and about 200°C for a time sufficient to increase resistance of the imageable element to an alkaline developer and to decrease the white light sensitivity of the imageable element;

(d) thermally imaging the imageable element and forming an exposed imageable element comprising exposed regions and unexposed regions; and

(e) developing the exposed imageable element and removing the exposed regions;

in which:

the imageable element comprises a photothermal conversion material;

the imageable layer is ink receptive;

the imageable layer is insoluble in the alkaline developer;

the imageable layer comprises:

a first polymeric material, and

an *o*-diazonaphthoquinone containing material; and

the underlayer comprises a second polymeric material.

22. The method of claim 21 in which the imageable element is heated to a temperature between about 130°C and about 200°C for about 30 seconds to about 10 minutes.